FRD ACTIVITIES REPORT
May 2006

Research Programs

Joint Urban 2003

Analysis of the JU03 tracer dispersion dataset continued in the month of May. The analysis of two daytime experiments (IOPs 3 and 6) and two nighttime experiments (IOPs 7 and 8) has now been completed. Many of the results can be described in terms of "near" (less than a city block) and "far" (distances greater than a city block) fields. A key aspect of this research is the peak-to-mean ratio. It has been found that the peak-to-mean ratios in the near field are usually much greater than the far field both day and night (Fig. 1).

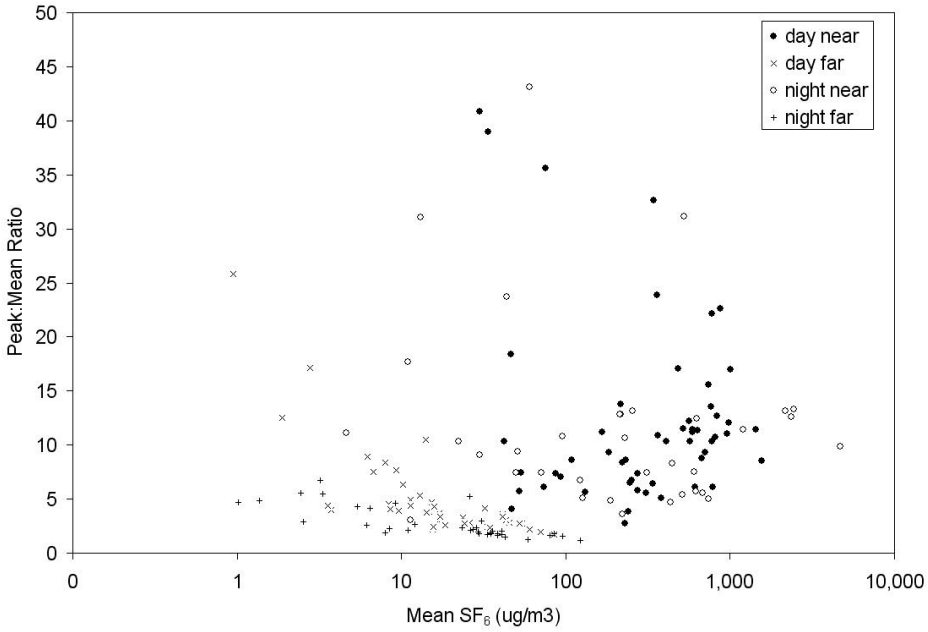

Figure 1. Peak to mean tracer concentration ratios of the near (Miran instruments) and far (TGAs) fields during the day and at night.

A distinct difference was also found between day and night for the far field. The daytime far field is characterized by moderately high peak-to-mean ratios (average 5.3 and 4.3 for IOPs 3 and 6, respectively), higher concentration fluctuation intensities (standard deviation of tracer concentration divided by the mean tracer concentration), and higher skewness values. The nighttime far field is characterized by lower peak-to-mean ratios (3.1 and 2.6 for IOPs 7 and 8, respectively), concentration fluctuation intensities, and skewness values. These differences can be explained by the character of the tracer time series. Daytime signals were characteristically very peaked and periodic and thus had high standard deviations and positively asymmetrically skewed probability distributions. In contrast, nighttime signals in the far field tended to be only weakly periodic, or aperiodic, and the tracer arrived in a major pulse and then lingered with much less concentration fluctuation until final dissipation after the release had ended. The tracer plume also arrived sooner and dissipated more quickly in the daytime than the nighttime. In a few nighttime cases measurable quantities of tracer persisted in the far field for almost an hour

after the release had ended. The characteristic exponential tracer decay time averaged 82 seconds for daytime IOPs and 128 seconds for nighttime IOPs.

A comparison of tracer concentrations measured by vertically collocated street level and rooftop samplers in the downtown area suggests that, in general, there is no readily predictable difference between street and rooftop tracer concentrations for daytime or nighttime IOPs. While there were very large differences between street and rooftop concentrations in many instances, the concentrations tended to be comparable in most cases. Tracer concentration measurements made in the tunnel network showed that the tracer was sometimes slower to arrive but it persisted at higher concentrations until well after it had already dissipated at the surface. There is no evidence to support the idea that a plume could be reliably avoided by fleeing upwards or downwards during the day or night. (Dennis Finn, 208-526-0566)

ET Probe

A white paper entitled "The Non-gradient Contribution of Coherent Structures to Turbulent Fluxes in Tropical Cyclone Boundary Layers" was put together by a group of researchers who met during the Monterey, CA hurricane conference last April. Dr. Ralph Foster from the University of Washington took the lead. The paper describes the accumulating theoretical and observational evidence indicating that coherent structures play a significant role within the hurricane boundary layer and may have a large effect on surface fluxes. It is hoped that the white paper may spur some interest within funding agencies, possibly as a follow-on to the CBLAST program. (Richard Eckman, 208-526-2740)

Smart Balloon

The six smart balloon transponders are still in the process of being fabricated for the upcoming TexARQSII air quality study to be conducted in Houston this summer. Progress is still being made on the transponder fabrication despite not receiving the satellite modems. Delivery of the modems is expected in the first days of June.

A more suitable location for balloon launches has been found in the La Porte area (east of Houston). The location is better suited for flying the balloon in the shipping channel where the NOAA ship Ronald H. Brown will be making measurements. This new launch site should allow placement of the balloons above or near the ship, if conditions allow. The new location is also located at the La Porte airport where space is available inside an aircraft hangar.

Departure for Houston will be on August 10th, 2006 with August 15th as the first possible date that a balloon flight will take place. (Randy Johnson, 208-526-2129)

UrbaNet

FRD and ATDD are continuing to discuss collaborations related to UrbaNet. The main focus has been on the use of wind and turbulence forecasts from numerical models in an urban dispersion model. For some dispersion applications, an imprecise wind forecast may be sufficient as long as the forecast is on average accurate. However, for toxic releases the tolerance for such errors is

much diminished, since lives may be at stake. In these situations, precision counts as much as accuracy. FRD and ATDD are discussing methods that could be used to recover from situations when a model is clearly generating a poor wind or turbulence forecast. The focus has been on the use of urban tower observations to adjust the model forecasts using probabilistic techniques. (Richard Eckman, 208-526-2740, Will Pendergrass, ATDD)

Another of FRDs UrbaNet tasks is to help prepare for a possible urban dispersion tracer test in Las Vegas. Before the test can be conducted, it will be necessary to check for fugitive sources of the SF_6 tracer in the planned study domain. FRD has contacted the local utility company in Las Vegas to locate possible fugitive sources of SF_6 in the area. Locating fugitive SF_6 sources will save time and money in preparing for a full scale SF_6 atmospheric tracer study in the future. (Jason Rich, 208-526-9513)

Atmospheric Tracer Chemical Analysis Upgrade

We have leased two halogen specific detectors from OI Analytical for two months with the intent to test them with the gas chromatographs (GC) and as possible replacements for the continuous tracer analyzers. The detectors were received the first week of May. They have been interfaced to two GCs and we are successfully using them to analyze our tracer standards. The detection limits initially observed appear to be too high for our use, but we will try to improve these over the next month. We also plan on testing one detector in a continuous analyzer mode to learn as much about their capabilities as possible while we have them available. (Roger Carter, 208-526-2745, Debbie Lacroix)

Cooperative Research with DOE NE-ID (Idaho National Laboratory)

Emergency Operations Center (EOC)

On May 10 a drill was held at the INL Emergency Operations Center involving an incident at Fort St. Vrain. The drill was centered around a tornado that struck a nuclear storage facility and Administration building at Fort St. Vrain. FRD ran a plume projection using ARL's READY HYSPLIT model and provided meteorological support during the drill. (Jason Rich, 208-526-9513, and Brad Reese)

On 30 May, Team D participated in another drill at the EOC. This was the second scheduled drill for Team D. The scenario for this drill focused on the Materials Fuels Complex (MFC). (Richard Eckman, 208-526-2740, Debbie Lacroix, Dennis Finn)

INL Climatology

A draft version of the Atmospheric Transport and Diffusion chapter has been completed for the revised INL climatology report. Next, the draft must be integrated with the other chapters to ensure consistency in notation and numbering of figures. The overhaul of the diffusion chapter was one of the major remaining tasks for completing the climatology report. An internal draft of the report should be completed in the next couple of months. (Richard Eckman, 208-526-2740)

A number of sections of the draft revision of the INL climatology reference the 2nd edition of the INL Climatography. However, there are no more copies of the 2nd edition to distribute. With that edition out of print, a PDF of the older version is being created so that readers of the revised climatology will be able to have access to the older version. The PDF copy of the 2nd edition will be ready to distribute when the new edition is ready for publication. (Jason Rich, 208-526-9513)

Mesoscale Modeling

A new Dell Linux workstation has been ordered for local testing of the Weather Research and Forecasting (WRF) mesoscale model. WRF is a next-generation numerical model that is slowly replacing some of the older models such as MM5 and RAMS. In fact, one version of WRF (called NMM) is scheduled to become one of the primary NOAA weather forecast models in June. At FRD, a high-resolution configuration of WRF will be tested for its ability to forecast atmospheric flows within the Eastern Snake River Plain and in the surrounding mountains. It will be compared with the current MM5 modeling system at FRD, which is run at 4 km horizontal grid spacing. The new workstation has two Intel dual-core processors, so it is expected to be considerably faster than the current MM5 workstation. (Richard Eckman, 208-526-2740)

Other Activities

Safety

On 22 May, the Greater Idaho Chapter of the American Red Cross visited FRD and provided CPR and First Aid training to the staff. Everyone who attended the training sessions became certified in both CPR and First Aid.

Travel

Kirk Clawson and Dennis Finn, May 2-4, Salt Lake City, UT, for UDP meeting.

Dennis Finn, May 8-11, Silver Spring, MD for HYSPLIT training.

Training

Dennis Finn attended the HYSPLIT Training Workshop in Silver Spring, MD May 9-11, 2006.

Personnel

The Quickhire questions for the Administrative Assistant position at FRD were submitted to WMO-Boulder on May 30, 2006.